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INSECT NOTES FOR 1911.

This bulletin contains brief notes of some of the more important insects of the year 1911, among them the spruce bud moth, the apple maggot, and a parasite of the brown-tail moth, as well as more extended accounts of an elm-leaf beetle, of wire worms and of *Pemphigus tessellata*.

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BULLETIN No. 195.

INSECT NOTES FOR 1911.*

O. A. JOHANNSEN,
EDITH M. PATCH.

The miscellaneous notes here presented are for the most part abstracts from our Station records for the current year. Though some of the items are trivial they contain data by way of direct observation, locality or host plant record which give them a certain significance for our own State. Many of the notes are rendered more complete by the summer collections and insectary work of Mr. William C. Woods to whom as well as to various voluntary collectors throughout the State, a general acknowledgment is due.

COLEOPTERA.

ELATERIDAE.

Wire worms in corn.

In the spring of 1911 a two acre plot was planted with sweet corn at Highmoor Farm, Monmouth, Maine. Owing to the great number of wire worms present, many of the seeds were so badly eaten that they failed to germinate and many of the plants showed such feeble growth that only a partial stand on the lower and none upon the upper portion of the plot was obtained. This circumstance gave us an excellent

* Papers from the Maine Agricultural Experiment Station: Entomology No. 48.

opportunity to experiment under Maine conditions with various methods which have been recommended for the extermination of wire worms in the past as well as to try out newer methods.

It may be stated that the plot had been in potatoes last year and in sod for a number of years previously. Last fall (1910), the field was plowed late, after the ground was stiffened by frost.

The upper part of the field was divided into 20 plots, each 9 feet wide by about 200 feet long, the lower part into plots 6 feet wide by 100 feet long.

On the 25th of July, the few stunted plants still remaining on the upper part of the field were hoed down and the plots without previous plowing were planted as follows, alternate plots being left fallow.

Plot 1. Grains coated with tar and Paris green.

Plot 3. Grains coated with arsenate of lead.

Plot 5. Check row, grains not treated.

Plot 7. Canada field peas.

Plot 9. Plowed July 27 and weekly thereafter for 6 weeks.

Plot 11. Check row, grains not treated.

Plot 13. Handful of tobacco dust placed in each hill; grains not otherwise treated.

Plot 15. Handful of slaked lime placed in each hill; grains not otherwise treated.

Plot 17. Check row, grains not treated.

Plot 19. Handful of "bug death" placed in each hill; grains not otherwise treated.

The remaining plots on the lower part of the field were planted in the same way and in the same order, as a check, and in addition 3 shorter plots were added in which Sherwin-Williams Soil Fungicide was used in the hills.

Germination tests upon the seeds show them to be of good quality.

Record of results.

Plot 1. Grains coated with gas tar, then rolled in Paris green until well covered. Grains failed to germinate as they were too heavily coated. Wire worms were still present in September.

Laboratory check test. Several wire worms were placed in a small covered jar with several similarly coated grains on Oct. 26. The larvae avoided the grains. A month later Paris green-coated grains were put into the same jar; these were likewise avoided. Later still sprouting grains were taken, covered with Paris green but leaving the root and sprout unpoisoned. The larvae in this case attacked sprout and root but left the grain untouched.

Plot 3. Grains were rolled in a paste of arsenate of lead of the consistency of cream and allowed to dry before planting. Resulting stand of corn very poor, no better than the check rows.

Laboratory check. Several wire worms were placed in a small jar with some grains with which special pains were taken to coat them heavily with arsenate of lead. Several days later, some larvae were seen, each half buried within the grain, the hull intact except for a small hole the diameter of the insect's body. A month later only the hulls of the grains remained. All the wire worms were still alive and apparently healthy.

Plots 5, 11, and 17. Check plots in which untreated corn was planted. Stand very poor in September; wire worms present.

Plot 7. Planted with Canada field peas. Stand excellent in September. Only a few wire worms found and these at the lower end on the margin of the plot.

Plot 9. Plowed weekly from July 27 to about Sept. 1. To be planted next year to determine effect of excessive cultivation of the soil upon wire worms.

Plot 13. A handful of tobacco dust was placed in each hill with the corn. Stand very poor in September. The tobacco when put into the ground was very strong but when the plants were examined for wire worms it was found to be almost odorless, at which time the wire worms were apparently attracted by the tobacco as they were especially abundant in it.

Plot 15. A handful of slaked lime was placed in each hill with the corn. Stand very poor in September. Wire worms were found among the roots of the plant surrounded by the more or less caked lime, apparently not inconvenienced thereby.

Plot 19. "Bug death" instead of lime; otherwise as in Plot 15. Stand very poor in September; wire worms present.

Plot X. Sherwin-Williams Soil Fungicide used instead of lime; otherwise as in Plot 15. Stand very poor in September; wire worms present.

Corresponding results were obtained on the second series of plots.

An additional laboratory experiment was made to determine the effect of calcium carbide upon wireworms present in the soil.

(a) Several wire worms were placed in a shallow uncovered dish, 75 mm. in diameter, with a piece of calcium carbide weighing about 6 grams and covered with earth. The small amount of moisture present was sufficient to disintegrate the carbide and fumes were no longer given off at the end of 24 hours. The wire worms were active and unaffected by the treatment.

(b) One wire worm was exposed to the fumes of 2 grams of the carbide in a 25 cc vial tightly corked. After 3 hours the larva was motionless, but fully recovered after a few hours when placed in a clean vial.

From the foregoing account it will be seen that the poisons and repellants used, usually so successful in combating insects under other conditions, were not efficient against wire worms in our tests. The successful growth of the peas leads one to believe that a rotation involving peas, or possibly peas and oats, a common fodder crop in this state, or clover, may be effectively employed though whether wire worms are thereby actually reduced in number in the field so they may be less injurious upon susceptible crops planted later, future experiments alone will decide.

Experiments along these lines are planned for next year, following in part, some suggestions made in the papers on wire worms published by the Cornell and the Illinois Experiment Stations.

It may be of interest to note that the adult beetles *Melanotus fissilis*, *Asphes brevicollis*, and *Corybites cylindriciformis* have been captured at Highmoor Farm. The larvae found, also represent 3 species, an *Asphes* (or *Corybites*), a *Melanotus* and one resembling *Agriotes mancus* as figured in Forbes' 7th Report. Adults from these have not yet been reared.

The same species of larval Elaters were found in adjacent potato fields causing some injury to the crop (Fig. 93).

Melanotus fissilis.

That Elaters have been active in diverse ways this season is further indicated by a complaint which accompanied some adult beetles of this species from Auburn, August 12. They were accused by the sender of eating his plums about as fast as they ripened. Lot 1383.

NITIDULIDAE.

Carpophilus sp.

On the 17th of July a number of cones from red spruce (*Picea rubra*) were brought into the laboratory for examination by Professor M. A. Chrysler of the University of Maine. The cones were all seriously affected by a rust and also honey-combed by insects. A subsequent examination showed that most of the cones on several trees on Standpipe Hill, Orono, Me., were thus injured. Besides the larvae of 2 species of Tineids (not yet reared), a species of Sap beetle (*Carpophilus sp.*) apparently undescribed, was found. This insect resembles *C. marginatus* in color and size but differs in the form of the lateral margins of the thorax, which are more curved than in *C. marginatus*. In addition to these, 2 hymenopterous parasites, a Chalcid and a Braconid noted elsewhere were obtained. Lot 1386.

PTINIDAE.

Ptinus fur.

This old world pest was found over-running a store at Ellsworth Falls Oct. 16, 1911, where the owner reported it as infesting grain and flour in storage, and troublesome in sugar, meal, crackers, clothing, papers, etc. A similar infestation was reported from Ellsworth Falls, Oct. 27, 1906. Lots 1436 and 1436 Sub. 1.

CHRYSOMELIDAE.

Haltica carinata as an Elm Leaf Pest.

In 1907 and again in 1911 the elms near Orono were attacked so extensively by a leaf beetle that an account of the insect and its work in this locality seems desirable.

The adult beetles are found feeding upon the elm leaves in June, and the field notes for 1907 record them as mating on June 14. On June 26 of the same year, one of the writers observed their yellow eggs in rows along the midrib and other veins of the elm leaves. The adult beetles feed upon the elm leaves at this time and Fig. 94 shows the character of their injury.

But, as would be expected, the chief damage is done by the larvae which skeletonize the leaves as shown in Fig. 95. So abundant was this insect in 1911 about Orono that the foliage of some elms was very seriously damaged in this way, the injury presenting identically the appearance of that caused by the imported elm-leaf beetle. The larvae of this *Haltica* become full fed late in July and descend to the ground for pupation which takes place for the most part before August. This season larvae were bred in the insectary where the adult beetles began to emerge August 15. A field excursion resulted in the capture of adult beetles in the infested region August 23.

The beetles collected at Orono in 1907 and 1911 are burnished copper with dark blue reflections or dark metallic blue with bright coppery red reflections. They measure from a little less to a little more than 4 mm. The collection of 1907 was determined by Mr. E. A. Schwarz as *Haltica carinata* Germ. We have as yet no Maine record of their appearance in anything but *Ulmus americana*. Lots 29, 1393, 1403.

The larvae resemble those of *Galerucella luteola* in appearance but differ in being a little smaller and paler, and in having smaller tubercles, each of which is provided with but 2 or at most 3 small setae instead of from 4 to 6 on each tubercle as is possessed by the imported elm-leaf beetle larva. The larva of *H. carinata* somewhat resembles that of *H. ignita* figured by Chittenden in Bul. 23, N. ser. U. S. Div. Ent.

Galerucella luteola.

The imported elm leaf beetle was present in Fryeburg, Me., this season and adults were captured in October in houses where they had entered for hibernation as is their custom. Lot 1418.

CURCULIONIDAE.

Cryptorhynchus lapathi.

The poplar weevil, an imported insect, the larva of which

bores in poplar and willow and which is in some localities a serious pest, is widely distributed through Maine as is indicated by specimens of the adults collected this season at Orono, Augusta and Presque Isle, late in July and in August. The specimens from Presque Isle were reported from Carolina poplar.

SCOLYTIDAE.

Xyleborus dispar.

Specimens of shot-borers were received June 19 from West Stoningham with the report that they had caused the death of a young Bismarck apple tree. Lot 1359.

ORTHOPTERA.

Crickets and Roman Wormwood.

Late in September the contented chirp of our common Gryllus along the roadside drew our attention to great numbers of these fat bodied crickets perched among the branches of the Roman wormwood, *Ambrosia artemisiifolia*, where they were gorging themselves with the fruit of this pestiferous ragweed. Both males and females were so intent upon their meal that they could be collected by hand with no precautions as to alarming them. A number of the crickets were watched in the laboratory for a week or so where they continued their feast with an evident enjoyment.

HOMOPTERA.

PSYLLIDAE, APHIDAE AND COCCIDAE.

Aphalara polygoni Mally (Förster?)

A large collection of the species well figured by Mally 1894 (1895) as *polygoni* was made October 18 at Orono from *Polygonum* near the bank of the Stillwater River. Both winged insects and pupae were abundant at date of collection chiefly along stem at leaf axil and in dried and crumpled leaves. Lot 1341 Sub. 7.

Aphis pomi.

At Highmoor Farm, June 28, colonies of the green apple aphid were abundant on leaves near the fruit and also present in great numbers feeding on the green fruit itself. On Septem-

ber 9 the apterous form and pupae of this species were found colonizing on late tender growth of twig and on ventral side of leaves of *Spiraea Van Houttii* at Orono. Aphid Nos. 17-11 and 75-11.

Maerosiphum crataegi Monell.

This pretty yellow species with bright green abdominal spots was common near Orono this season, collections having been made from *Crataegus* at frequent intervals from July 15 to August 10. Aphid Nos. 30-11, 50-11, 58-11.

Schizoneura lanigera.

The woolly aphid of the apple was present this season late in August at Orono, Maine, in conspicuous colonies on *Crataegus* and mountain ash (*Pyrus sitchensis*) and two other cultivated species of mountain ash. Aphid Nos. 63-11, 64-11.

Pemphigus rhois.

The large and beautiful galls of this sumach aphid were sent in from Machias, Maine, Sept. 5.

Pemphigus venafuscus.

Fall migrants of this large aphid were on the wing in Orono during the entire month of October. They were seeking ash trees (*Fraxinus*), lilac, and mock orange (*Philadelphus coronarius*). On account of the flocculent wax attached to their bodies they resembled drifting snowflakes.

Pemphigus tessellata (acerifolii).

In order to ascertain whether the advent of the maple migrant is an annual necessity for the development of the species on the alder, a vigorous colony of hibernating nymphs was enclosed in a screen house in the spring of 1909; and protected for 2 years against migrants from the maple. The colony existed for these 2 years in a healthy condition. It is of interest to note that both falls in the third generation, winged migrants left the alder and not being able to reach the maple, died on the inside of the screen in great numbers. A more detailed account of this work will be found in the second part of this bulletin.

Aspidiotus perniciosus (San Jose Scale).

The occurrence of this orchard pest in Maine was recorded in Bul. 177 p. 28. This spring (1911) some infested twigs were sent in from an orchard near West Baldwin, Maine, about 12 miles from the locality where the species was first discovered. Lot 1354.

Eulecanium cerasifex.

E. canadense, *E. caryarum*, *E. corylifex*, *E. cynosbati*, *E. fraxini*, *E. guiguardi*, *E. juglandis*, *E. maclurarum*, *E. websteri*, *E. fitchii*, and *E. pruinose* are all given as synonyms on page 70 of the 41st report of the Entomological Society of Ontario, 1910.

The species is apparently on the increase, more specimens having been sent in for identification than in previous years. We have records of its occurrence this year from elm, honey locust, ash, plum, and maple, from various localities in the State. Lot 1362.

DIPTERA.

CULICIDÆ.

Culex pipiens, *Aedes trichurus*, *A. atropalpus*.

In the vicinity of Orono, the most common mosquito during May and early June was *Aedes trichurus* (*cinereoborealis*) the larvae of which were extremely abundant in the swamps on the margins of the woods. During the summer the vicious *Aedes atropalpus*, *A. subcantans* or a related species, and the house mosquito *Culex pipiens* appeared in annoying numbers, the last being still prevalent in October.

MUSCOIDEA.

Hypoderma lineata (Ox bot-fly).

Bot-flies were abundant this spring at Orono, cows in pastures adjacent to woods were said to be particularly affected.

Cuterebra sp. from a mouse.

A larva belonging to this genus was sent July 31 by a correspondent from Brooklyn, Me., with the remark that 2 specimens were taken; stating further "———— they had eaten a

hole from under the left foreleg to the mouth of the mouse." The writer did not say whether the mouse was the common *Mus musculus* or a native species.

Phorbia fusciceps.

The bean maggot was again reported from various parts of the state doing much damage to young plants. Some growers reported the loss of half the plants. Injury to seed potatoes was also recorded.

Pegomyia vicina.

Many leaves of the beets growing on the University farm at Orono were found with the beet leaf miners. Some parasites belonging to an undescribed species of *Opius* were bred from this species. Lot 1392.

Rhagoletis pomonella.

As in the past the apple maggot continues to be by far the most serious dipterous pest in Maine. No better remedy than that of the destruction of windfalls either by pasturage or by gathering, advised by Professor Harvey years ago, can at present be recommended. The announcement made 2 years ago by Mally of South Africa that certain fruit flies related to our *Rhagoletis* were controlled by poisoned sweetened bait has led several entomologists in this country to experiment along this line. The Cornell (N. Y.) and the N. H. Stations in preliminary notices give hopeful accounts of their experiments. Our own experiments made this season upon two Talman sweet apple trees, using a spray of arsenate of lead and brown sugar in solution gave discouraging results. If circumstances permit these experiments will be repeated upon a larger scale next season, with a modification of the spray formula.

LEPIDOPTERA.

Items of at least local interest are recorded of several species of butterflies and moths some of which were particularly significant in 1911.

Anosia plexippus.

Great migrating swarms of monarch butterflies were reported to be passing through the southern end of Orr's Island late in August and to be still flying in great numbers Sept. 15.

Autographa brassicae.

The cabbage looper was collected from lettuce in Orono and moths of the bred specimens emerged August 29. Lot 1401. For a record of parasites of this species see *Amblyteles montanus*.

Bucculatrix canadensisella.

The birch leaf bucculatrix was as conspicuously abundant during the season of 1911 as during the preceding two summers when widespread devastations of foliage in late summer occurred as recorded in Bulletins 177 and 187 of this Station.

Bucculatrix pomifoliella.

At Winthrop, Maine, August 21, the apple leaf bucculatrix was found to be a very troublesome orchard pest. Lot 1384.

Cacoecia rosaceana.

The oblique banded leaf-rollers were reported as numerous in apple orchards June 13, at Newburg. Lot 1364.

Clisiocampa americana and *C. distria.*

Both the orchard tent caterpillar and the forest tent caterpillar were abundant in June about Orono and elsewhere.

Coleophora fletcherella.

The cigar case-bearer was numerous in Maine apple orchards in certain localities in June. Lot 1427.

Coleophora laricella.

As usual for Maine the larch case bearer was generally abundant on *Larix laricina* in June. Lot 1360.

Datana ministra.

A colony of yellow necked apple caterpillars were found feeding on *Amelanchier canadensis* August 23 at Orono. Lot 1387.

Ephestia cautella.

Specimens of this moth were bred from dried figs in February. Lot 1352.

Euproctis chrysorrhoea.

A remarkable circumstance in the development of the brown-tail moth in Maine this season should be recorded. Since the moth first entered Maine the caterpillars have not been recorded as feeding to a very troublesome extent in the fall and they have apparently been uniform in hibernating early in the third instar when about 1-4 inch in length. This fall, however, in many localities, they entered the fourth instar and were feeding freely enough upon the trees to be troublesome at apple picking and to destroy the foliage to a considerable extent. This circumstance is doubtless to be accounted for by unusual weather conditions. Whether the winter mortality will be higher for these caterpillars hibernating in a more advanced stage remains to be seen. While this fall growth of the caterpillars was common enough to call for wide spread comment, it was not universal, for colonies were also found to be wintering at the ordinary size.

For an encouraging record of parasites hibernating in the winter nests of the browntail moth, the reader is referred to the discussions of *Monodontomerus aereus* under the Hymenoptera.

Euvanesa antiopa.

The spring caterpillars of the mourning cloak butterfly were more abundant this spring than for several seasons.

Falcaria bilineata.

In July and August caterpillars of this species were collected from *Betula populifoliae* and bred. The moths for the most part emerged during August. Lots 1391 and 1391 Sub. 1.

Galleria mellonella.

Bee-moths were received from Presque Isle, Aug. 3. Lot 1380 Sub. 1.

Hyphantria cunea.

In contrast with the past three years the fall web-worm was conspicuous by its scarcity during the summer of 1911.

Oedemasia concinna.

The red-humped caterpillar usually abundant in Maine and commonly parasitized by *Limneria guignardi* had the additional interest this season of being attended by hyperparasites which apparently have not previously been recorded in this connection.

Phobetron pithecium.

A full fed caterpillar of the hag moth was collected August 22 from apple. Lot 1389.

Pholus pandorus.

The woodbine sphinx is apparently not common in Maine. A fully grown caterpillar was collected from *Ampelopsis quinquefoliae* in South Union, September 30. Lot 1421.

Tmetocera ocellana.

The apple bud moth was, as usual, destructive in many localities in June.

Tortrix fumiferana.

The spruce bud moth occurred in alarming numbers in the State this year. Reports of the devastations caused by the larvae on spruce and balsam fir from numerous localities were received and during the first two weeks in July the moths were reported as extraordinarily abundant at Castine and in the region of Greenville. The following extract from a letter of July 5 received from Mr. E. L. Dean of Greenville Junction gives an idea of the situation in that locality.

"We think the worms have all transformed to pupae, and most of the pupae have hatched into moths which are getting to be very numerous in the woods now. As nearly as we can learn the infested region is from the East Outlet of Moosehead Lake to Township No. 4, Range 6, B. K. P. W. K. R. We have not heard of any of the worms north of Moose River.

We cannot say how far south they are, but the centre of the infestation seems to be in the vicinity of Parlin Pond. The worms have been working on all sizes of spruce and fir trees and we think they have worked more on the fir than on the spruce. The worms have eaten this season's growth and the small trees from which the entire season's growth has been stripped are apparently dead."

Some pupae received from Greenville Junction were parasitized by *Pimpla inquisitor* and a Braconid parasite was also present in the State this season. Lots 1366 and 1381.

HYMENOPTERA.

TENTHREDINIDÆ.

Craesus latitarsus.

Larvae of this species were common upon the birch (*Betula populifolia*) in the vicinity of Orono in August and September. Adults appear in September. Lot 1420.

Nematus Erichsonii.

This species is apparently again on the increase, many larch trees (*Larix laricina*) were observed near Houlton July 20, to be badly attacked. Lot 1372.

ICHNEUMONIDÆ.

Limneria guignardi and *Hemiteles* sp.

The first named species is not uncommonly found as a parasite of the red-humped caterpillar (*Ocdemasia concinna*). This season, (August to October) cocoons were received from several localities. From some parasitized caterpillars sent from Easton, Maine, were obtained specimens of *Limneria* and also two hyperparasites belonging to the genus *Hemiteles*, resembling *H. sessilis* and *H. nemativorus* but differing from each. An examination of the cast skins revealed the hyperparasitic character of *Hemiteles*. Lot 1423.

Amblyteles montanus.

This species was bred from some specimens of *Autographa brassicae* Orono, Sept. 7, 1911. Lot 1401.

Pimpla inquisitor.

Several specimens of this species were reared from pupae of the spruce-bud moth (*Tortrix fumiferana*) which were sent from Greenville Junction, Maine, in July. Lot 1366 Sub. 1.

BRACONIDAE.

Opius sp.

Several specimens of an undescribed species belonging to the above named genus were reared from the beet maggot or its pupa (*Pegomyia vicina*) July 21, Orono, Me. Lot 1392 Sub. 1.

Bracon sp.

Two specimens belonging to this genus and several Chalcids (*Elachertes sp.*) were reared from the insects which were infesting the cones of yellow spruce, noted under Coleoptera (*Carpophilus*) July-August, Orono, Me. Lot 1386 Sub. 5.

CHALCIDAE.

Elachertes sp.

Associated with the *Bracon sp.* noted above. Lot 1386 Sub. 5.
Monodontomerus aereus (a parasite of the brown-tail moth).

About five years ago this species was imported from Europe and distributed in Massachusetts by the Entomologists engaged in the Gypsy and brown-tail moth investigations. The species has gradually been spreading in Massachusetts and last year was discovered in Maine. In March (1911) from some brown-tail winter nests received from Walpole, Maine, a few specimens of *M. aereus* emerged. This circumstance excited our interest, and at our request through the kindness of Mr. Wm. M. King about 100 more nests from the same locality were sent us from which we obtained over 60 specimens of the parasites. This record of the natural spread of introduced species of parasites is most encouraging and augurs well for the future aid furnished in the control of pests by their natural enemies. An account of the introduction of this species in Massachusetts is found on pages 43 et seq. of a bulletin entitled "Parasites" issued in 1910, under the direction of F. W. Rane, State Forester of Massachusetts, Boston, Mass. Lot 1336.

PEMPHIGUS TESSELLATA (ACERIFOLII)
on Alder and Maple.*

EDITH M. PATCH.

Since the identity of *Pemphigus tessellata* Fitch 1851 and *P. acerifolii* Riley 1879 was suggested (Patch 1908) the three succeeding years' observations confirm the previous evidence and leave no room for doubt that the alder and maple represent two hosts of a single species, the alder being the summer home of the progeny of the migrants from the maple.

But, as the life-cycle outline on page 247 indicates, we do not here have a simple case of alternate hosts; for the alder, besides serving for summer host for the progeny of the maple migrants, maintains a continuous series of apterous viviparous parthenogenetic females. Thus, ignoring the maple for the present, we have on the alder for the first spring generation the hibernating nymphs which over-winter under fallen leaves or loose earth at the base of the alder. These young nymphs climb up the alder stem on the first warm spring days sometimes in late March but usually in April in the vicinity of Orono. This apterous viviparous parthenogenetic generation becomes mature late in June and the progeny, a similar generation, matures about the middle of July. The third generation of viviparous parthenogenetic females becomes mature about the first of September. Part of this third generation are apterous and the progeny of these are the hibernating nymphs which become the first generation of the following spring.

But, as is indicated, part of the generation maturing about the first of September are winged. These, sexuparae or mothers of the true sexes, migrate to the maple where they do not settle to feed but seek rough places in the bark in which to deposit the almost microscopic apterous oviparous females and the still smaller apterous males. The over-wintering eggs are very soon deposited by the minute females, which like the males, die without feeding, both being without functional mouth parts. The stem-mothers hatch from these eggs about May 6 (Aphid 2-09). Their full career has not been followed but a mature stem mother (Aphid 9-09) was found on June 11 recently set-

* Papers from the Maine Agricultural Experiment Station: Entomology No. 49.

tled on a partly grown maple leaf (the inner, newest, third pair of the cluster of maple leaves) between two ribs at the base of the leaf with her head at the angle of the ribs. She had given birth to one nymph which stood with three legs on each side of a rib and its beak plunged into the rib. The stem-mother is very much smaller than the apterous forms on the alder. The progeny of the stem-mother become winged about the middle of July or a little later at which time the infested leaf looks like the accompanying figure 96. These are the spring migrants and they desert the maple for the alder before bringing forth progeny.

In order to ascertain whether the advent of the maple migrants are an annual necessity for the development of the species on the alder, a vigorous colony of hibernating nymphs was enclosed on alder in a screen house in the spring of 1909 and protected for two years against migrants from the maple. The colony existed for these two years in a healthy condition and, protected as it was from natural enemies, thrived much better than the infested alder. It is of interest to note that both falls in the third generation winged migrants left the housed alder, and not being able to reach the maple, died on the inside of the screen in great numbers.

How long this independent apterous viviparous parthenogenetic cycle on the alder could be maintained is not known. The experiment in question showed that a large colony was in good condition at the close of the second season, but by Sept. 8 of the second year (1910) one bush had been completely killed by the sapsucking colony and the sticky honey dew and the attendant fungus. The flocculent appearance of an infested alder branch is shown in figure 97. The other stems were so sickly that they gave no promise for food a third season so the observations were closed with the evidence of two years.

A counter experiment is planned in which an uninfested alder will be caged and only the migrants from the maple admitted in order to ascertain whether their progeny will establish a continuous viviparous cycle upon the alder or perhaps it would be better stated, in order to ascertain what will happen.

The economic aspect of this species varies with the locality. In Maine the alder (*Alnus incana*) along the rivers and streams is not valued and the insects infesting this growth are not sig-

nificant so far as the alder itself is concerned. However, as the cultivated cut leaved maple as well as the native variety of the same species (*Acer saccharium* L. *dasycarpum* Ehrh) is in Maine dependent for its infestation on the fall migrants from the alder, treasured ornamental maples could be protected by destroying the alder in the vicinity. The practicability of this course would depend on the quantity of the neighboring alders.

In Minnesota (Washburn 1903) and elsewhere where the infestation of alder clumps themselves is regretted, remedial measures can often be applied directly to the alder. As the alder is a permanent host of this species, one thorough treatment should be sufficient for a year at least. The landscape gardener would perhaps save himself trouble if he withheld susceptible maples from the vicinity of native alders.

LIFE CYCLE OF PEMPHIGUS TESSELATA (*acerifolii*).

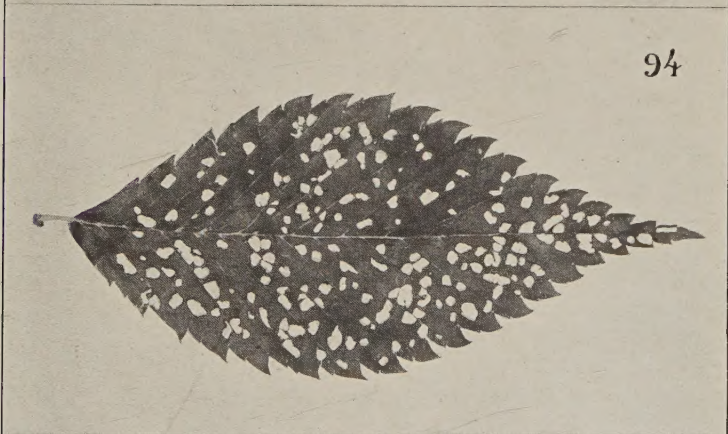
ALDER.		MAPLE.
NYPHPS (hibernating under leaves Oct. to April; becoming mature apterous viviparous parthenogenetic females, late June.) <hr/>		EGGS (on bark over winter). <hr/>
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SECOND GENERATION (apterous viviparous parthenogenetic females mature mid July). <hr/>		STEM MOTHERS (mature June 11). <hr/>
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.	Migrates mid	SPRING MIGRANTS (mature mid
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.	July to alder.	
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THIRD GENERATION.		
Apterous viviparous parthenogenetic females, mature Sept. 1.	Alate viviparous parthenogenetic females mature Sept. 1; fall migrants, sexuparae, migrate Sept. 1 to maple...	
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		APTEROUS OVIPAROUS FEMALES AND APTEROUS MALES. <hr/>
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NYPHPS (hibernating).		EGGS (on bark over winter).

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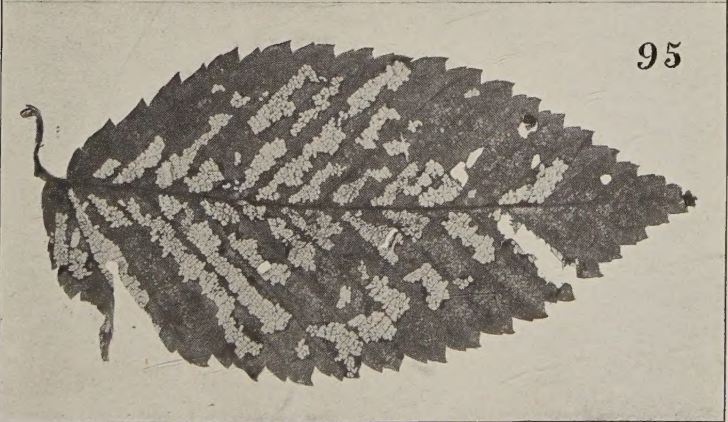
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93



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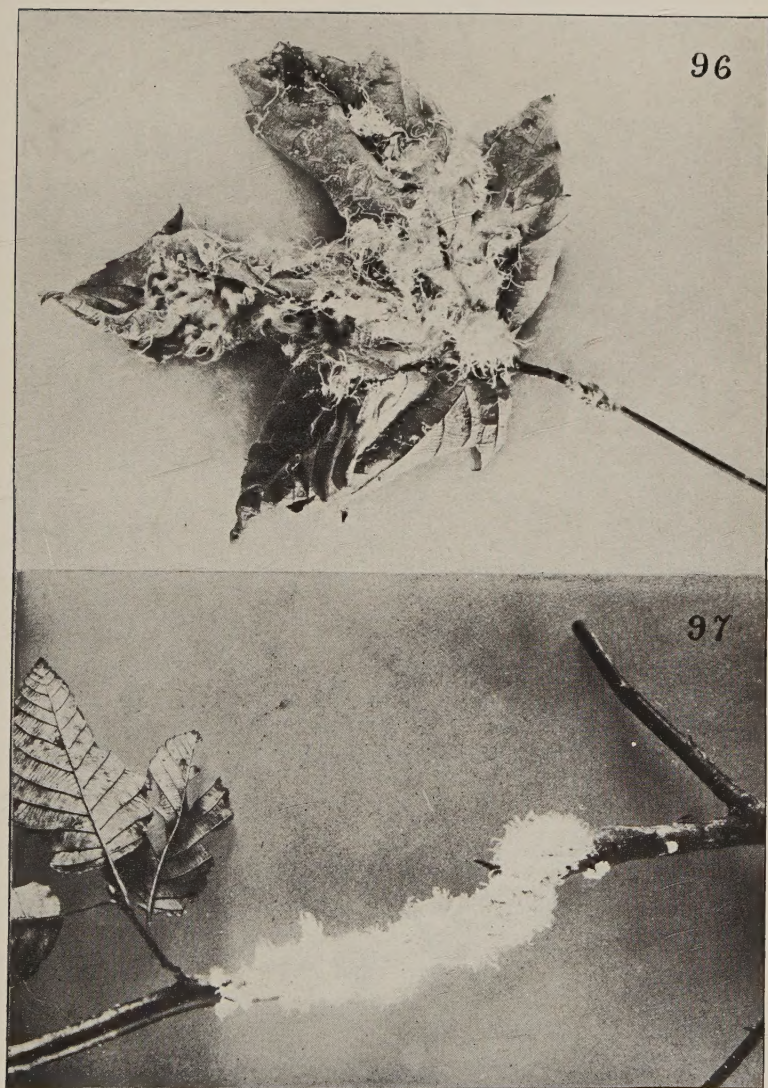


95

FIG. 93 Section of potato showing wire worm injury.

FIG. 94 Elm leaf injured by adult Beetle (*Haltica carinata*).

FIG. 95 Elm leaf injured by larva of *Haltica carinata*.



Pemphigus tessellata on Maple (FIG. 96) and on Alder (FIG. 97).

